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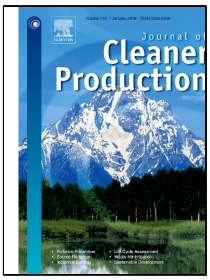

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Managing Urban Transitions in Theory and Practice - The Case of Climate-KIC's Transition Cities Project

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HIGHLIGHTS

- Transition Management (TM) is conceptualised as a form of urban climate governance.
- Two EU Urban Transition projects are analysed.
- Five barriers are identified which counteract local TM implementation.
- Future research should focus on the difficulties arising during application of TM.

Managing Urban Transitions in Theory and Practice - The Case of the Pioneer Cities and Transition Cities Projects

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ABSTRACT

The central role of cities in advancing sustainability transitions is nowadays universally recognised by the scientific community. Simultaneously, local leaders increasingly advocate for the sustainable, low-carbon development of social and technological systems in their cities. This situation provides a window of opportunity for academic research to guide the development and implementation of innovative governance mechanisms capable of delivering urban low-carbon transitions in practice, and for practitioners to influence research. The current interest in tailoring the Transition Management (TM) approach to the urban scale is a result of such an interaction. However, as we argue in this article, there is still much to learn about the ways in which decisions related to local transitions are made *in practice*, in order to build a more complete understanding of the usefulness of TM techniques in the urban context. Our claim is based on a case study analysis of a pair of EU-funded projects involving eight cities from a diverse set of European countries. The main findings highlight the role of five contextual barriers specific to the urban level within the European multilevel governance scene, which sustain inertia and resistance to change among municipal administrators and other local stakeholders and counteract the successful implementation of TM-inspired governance mechanisms at the local level. As a consequence, a rather shallow version of TM is applied in practice, which is not powerful enough to overcome the messy and contingent character of decision-making surrounding ongoing urban low-carbon transition processes.

Keywords

Urban Low-Carbon Development, Urban Climate Governance, Sustainability Transitions, Transition Management, Experimentation, Urban Transition Labs

Abbreviations

PC = Pioneer Cities; TC = Transition Cities; TM = Transition Management; T-Team = Transition Team; UTL = Urban Transition Labs

1. INTRODUCTION

This article aims to answer the following question: What obstacles may limit the potential of Transition Management (TM) to support urban low-carbon transitions? We conceptualise TM as a governance mechanism (i.e. coordination model in a polycentric social context where powers and responsibilities are dispersed among a range of actors) to render local sustainability transitions governable (i.e. possible to govern), and we argue that in the ongoing process of tailoring TM to the urban context it is necessary to open up a discussion about how urban (transition) policies are made in practice. This is particularly important because the search for new governance models in order to 'do more with less', both in terms of minimising costs as well as maximising impacts of low-carbon activities, has been subject to growing interest in TM techniques in relation to managing low-carbon development locally (Voytenko et al., 2016; Bulkeley et al., 2013; Quitzau et al., 2013; Hodson and Marvin, 2010). However, TM (Loorbach, 2007, 2010; Kemp et al., 2007) is a relatively young research field that is still being shaped, mainly through national level case studies with a sector-specific focus (for example Vinnari and Vinnari, 2014; Frantzeskaki et al., 2012; Loorbach and Rotmans, 2010; Avelino, 2009). Therefore, understanding the complications involved in its application, particularly in urban settings, is still a 'work in progress' (Nevens et al., 2013; Quitzau et al., 2013; Truffer and Coenen, 2012; Coutard and Rutherford, 2010). The contribution of this article is in highlighting the role of five practical implementation barriers of steering innovation processes towards low-carbon transition when TM-inspired techniques are applied in European cities. Our argument is derived from the case study analysis of two successive EU-funded projects set up by Climate-KIC[1]: Pioneer Cities and Transition Cities.

Over the past decade, the notion of transition has become ever more integral in the pursuit of sustainability, particularly with respect to the challenge of decarbonising society. Policy makers, private sector bodies and non-governmental organisations increasingly advocate for the need for low-carbon transitions, across a range of sectors from energy provision to mobility, food production to everyday spheres of consumption. With the overwhelming majority of Europeans living in and around cities (EU, 2016), it seems apparent that the transition to a low-carbon society must include the sustainable transformation of urban (socio-technical) systems. However, this is not a straightforward process; coordination problems within the multilevel governance context, the lack of financial and human resources among local actors, as well as lack of knowledge and issues with regard to measuring actual carbon emissions may hinder the progress, even in cities pioneering the low-carbon agenda (Khan, 2013). Furthermore, the quest for economic growth and attracting investments often override climate targets in the contemporary globalised economy (Bulkeley, 2010). As a result, the lack of sufficient capacity or willingness to coordinate system-wide change resulted in a voluntarist, largely piecemeal approach to urban climate governance, consisting of isolated, stand-alone transition initiatives (Bulkeley and Betsill, 2013). However, the possibility and desirability of exploring more efficient ways of governing urban transitions is increasingly being recognised by local authorities. Inspired by systems thinking, a number of cities started introducing a more strategic approach to transitions. Most notably, the TM approach received much attention from the local level (Loorbach et

[1] Climate-KIC (Knowledge and Innovation Community) is Europe's largest public-private innovation partnership focused on climate innovation to mitigate and adapt to climate change. Further information on the KIC's activities is available from www.climate-kic.org.

al., 2016; Voytenko et al., 2016; Porter et al., 2015; Frantzeskaki, 2014; Nevens and Roorda, 2014; Roorda and Wittmayer, 2014).

This article contributes to the growing literature on the implications of governing urban low-carbon transitions in a more strategic way through TM-inspired techniques (Loorbach et al., 2016; Voytenko et al., 2016; Bulkeley et al. 2015; Nevens and Roorda, 2014; Bulkeley et al. 2013; Nevens et al., 2013). First, we contrast the two most prominent theories about the governability (i.e. the feasibility of governing) of urban sustainability transitions: governing by experimentation and TM. In the empirical part of the article we introduce our case studies and analyse them using the 'Urban Transitions Labs' framework (Nevens et al., 2013), a sub-concept of TM focusing on the city level. Finally, we discuss our empirical findings in the light of expectations derived from theory, highlighting a number of issues worthy of consideration when attempting to transfer the TM approach to the European urban context.

2. THE GOVERNABILITY OF URBAN TRANSITIONS

Today, many cities have climate targets (e.g. currently over 7,500 signatories to the Covenant of Mayors have pledged to reduce greenhouse gas emissions at least by 20% by 2020), but a systematic approach for implementation is often lacking. Municipalities rather prefer 'no-regret measures' on a case-by-case basis (Bulkeley, 2013: 190). Instead of integrated and planned approaches for tackling climate change locally, piecemeal responses are given on an ad-hoc basis when windows of opportunities emerge (for example when new funds have been raised). This project-based governing mode has been identified as key characteristic of urban responses to climate change. A growing number of researchers have described this phenomenon as "governing by experiments" (e.g. Evans et al., 2016; Bulkeley et al., 2015; Bulkeley, 2013; Bulkeley and Castán Broto, 2013; While et al., 2004), defined as a distinctive mode of governing applied by policy makers, researchers, businesses and communities that are charged with finding new pathways in a changing urban climate (Evans, 2011). Conceptually, experimentation is then not understood as single ad-hoc answers or simply coincidence, but as specific mode and an ongoing, unfolding and heterogeneous set of processes to encounter the policy problem of climate change on the urban scale (Bulkeley et al., 2015).

Reasons for governing climate change by experiments are manifold. The uncertainty about locally relevant climate change effects (Bulkeley et al., 2015; Bulkeley, 2013); the multiplication of policy vacuums due to increasingly fragmented governance (Bulkeley et al., 2015); the ongoing budgetary and personnel constraints which make opportunistic case-by-case approach more likely (Hajer, 2016); and the lack of institutional and political capacity (Bulkeley, 2013) to deliver integrated and planned approaches may lead to piecemeal responses. From this perspective, the experimentation process is characterized by bringing about alternative arrangements to govern urban activities in an organic, messy way in response to the unstructured, complex problems of ongoing low-carbon transitions.

Karvonen and van Heur (2014; c.f. Evans, 2011) argue that governing by experiments is not a new phenomenon in the urban context; historical transitions, such as the development of water, electricity, and communications networks resulted from experimental processes rather than from strategic planning. They go on to conclude that 'experimenting' is the natural, organic process of bringing about change in cities. Therefore, the challenge is to understand how experimentation can

become a tool to steer and control innovation (Karvonen et al., 2014) towards more sustainable urban societies.

The TM model (Loorbach, 2007, 2010; Kemp et al., 2007) may offer potential solutions to this issue by conceptualising and connecting various governance activities associated with short, mid- and long-term goals and with their evaluation (fig. 1). In TM, long-term goals are developed through 'envisioning' activities (strategic level). Visions are expected to act as frameworks for mid- and short-term policy and action. In order to achieve long-term goals, 'transition pathways' are developed (tactical level); this is done by setting interim targets via back casting from long-term visions (Loorbach, 2007). The identified pathways act as guidelines for the selection of short-term actions, termed as 'experiments' (operational level). Thus, experiments are selected on the basis of their potential to contribute to overall strategic goals and their fit to identified pathways: they are expected to either confirm or alter the vision and the selection process for new experiments, resulting in a process of social learning ('learning-by-doing and doing-by-learning'; Rotmans et al., 2001).

The creation of such feedback loops introduces reflexivity into the decision-making system by providing mechanisms to incorporate newly discovered knowledge into the overall strategic (goals and visions) and tactical (pathways) framework. Thus, continuous evaluation, monitoring and adjustment are at the core of the TM concept, both with regards to the process and the content of experimentation (Kemp et al., 2007).

Figure 1: The Transition Management Cycle (cf. Loorbach, 2010).

In this interpretation, governing transitions becomes a strategic steering process:

'The model of transition management tries to utilize innovative bottom-up developments in a more strategic way by coordinating different levels of governance and fostering self-organization through new types of interaction and cycles of learning and action for radical innovations offering sustainability benefits' (Kemp et al., 2007: 80).

Up until the past few years, empirical studies of TM have mainly focused on national level transitions, implying that the natural scale for transitions to occur is the nation state (Truffer and Coenen, 2012). Therefore, building a more complete understanding of how TM methods may be implemented in

urban settings is still a 'work in progress'. Nevertheless, one attempt resulting from the recent focus on the local level in managing sustainability transitions by seeking to downscale TM is the 'Urban Transition Lab' framework (UTL) developed by Nevens and colleagues (2013). UTLs are portrayed as living laboratories aimed at developing transition agendas, pathways and delivering transition experiments:

'Urban Transition Labs are facilitated sites for creating (social) innovation and within which social change agents can initiate or inflict urban sustainability transitions' (Nevens et al., 2013: 115).

In the empirical part of this article we illustrate the practical applicability of the UTL concept in European cities by employing it as a framework for analysis of our case study projects. Based on the findings, we argue that the current European political and administrative context sustains several issues specific to urban governance that have an impact on the potential of TM-inspired strategic approaches to facilitate transformative change.

3. CASE ANALYSIS

3.1 INTRODUCTION AND METHODS

Two successive projects, called 'Pioneer Cities' (PC) and 'Transition Cities' (TC), set up by Climate-KIC, provide the empirical basis for this article. Through these initiatives, a network of cities worked together to identify and develop systemic approaches and organisational innovations required for transformative change. Eight cities from six European countries were involved in the projects: Birmingham (UK), Bologna and Modena (Italy), Budapest (Hungary), Frankfurt (Germany) and Valencia and Castellón (Spain). The project partners selected were fairly mainstream, medium-sized to large cities, covering a wide geographic area within the EU and representing a diverse set of local contexts in terms of social, political, economic and physical material characteristics. Despite such diversity, a range of common issues emerged during the implementation phase of PC and TC projects which attempted to introduce a more strategic, TM-inspired approach to governing urban low-carbon transitions. The aim of the present article is to assess these common barriers and highlight their importance in relation to EU policies, strategies and funding mechanisms.

The Pioneer Cities (2012-2013) project highlighted the role of the urban scale in enabling socio-technical transitions. Information was collected about recent or ongoing low-carbon innovation projects in the partner cities and the stakeholders involved (Pioneer Cities, 2013). This information was then converted into 'network maps', which represented the active innovation systems at the time in the partner cities. It was envisaged that these maps would become tools for facilitating system-wide change through building connections between isolated initiatives that the network maps identified. Furthermore, potential for cross-national knowledge sharing was identified, not only between the partners but also beyond, reaching out to other European cities. A follow-up project called Transition Cities was set up in 2014 to test and refine the methodology. Between 2014 and 2016, the partners decided to focus: on developing approaches to identifying pilot projects using the network maps; on replicating projects between cities; and outreaching to new cities by developing case studies of the experiences learnt during the projects (TC, 2014).

The present empirical analysis benefits from privileged access to first-hand information. Both authors were active members of the project consortium, had access to central project documents, and gained detailed insights through profound participatory observations on nine project meetings and several stakeholder workshops throughout the duration of the TC project (2014-2016). Therefore, a synchronous accompaniment of meaning-building processes was possible, increasing accurateness and validity. This is because, through participatory observation, social action can be recorded and documented *in vivo* (DeWalt and DeWalt, 2002), as opposed to relying on interviews, where such data must be reconstructed from the interviewees' narratives, interpretations or commentaries. Having said that, three interviews were carried out with project members and stakeholders to clarify certain questions and to support and triangulate the collected data. Interviews were semi-structured, with only open-ended questions asked. On average, the interviews lasted for between 30 minutes and one hour. Secondary data such as the project proposal, project reports, meeting minutes and results of the social network analysis were used to contextualise the observations and interview responses.

3.2 Project Design

The PC and TC projects were strongly inspired by Dutch transition theories and systems thinking (Kemp et al., 2007; Geels, 2006; 2005), adapting the concepts to the urban context in Europe. They aimed at facilitating low-carbon innovation in cities by developing a novel methodology for instrumental system analysis, envisioning and scenario-based pathway creation, and by providing financial support for experimentation (TC, 2013). In the following analysis we use the 'Urban Transition Labs' framework outlined by Nevens and his colleagues (2013). UTL is an approach developed parallel to our case study projects, which, however, represents well the PC and TC projects' design. The UTL concept builds on TM in terms of the conceptualisation of the transition process, depicting it as a cycle consisting of the following steps: preparation, envisioning, pathway creation, experimenting and monitoring and translation (c.f. Voß et al., 2009). UTL, like TM, is a scientific-analytical concept to study transition processes, which at the same time also aims at shaping political practice through being applied as a governance model to structure urban transition processes.

3.2.1 Preparation stage: System Analysis by the Transition Team

The Transition Team (T-Team), as defined by Nevens et al. (2013), refers to a collaborative organisation tasked with the initiation of the transition process, including: setting up the transition arena(s) (Loorbach and Rotmans, 2010; Kemp et al., 2007) both in terms of content and membership; guiding the work of the arena sessions and evaluating their outcomes; and overseeing the process as a whole, in order to ensure that the activities on the ground fit the pathway such that the envisioned local sustainable future is achieved. Participant selection for the arena processes must be based on 'instrumental actor analysis' by mapping potential stakeholders with regards to their backgrounds, competences, interests and power.

In the case of the Transition Cities, the body comparable to the concept of the T-Team was the 'project consortium', a collaborative arrangement involving municipal staff, process facilitators and transition scientists. Professional (technological) expertise in the particular fields of transition was lacking and had to be consulted via stakeholder workshops. In order to undertake a preparatory system analysis, the consortium started to work in 2012 and produced an inventory of ongoing low-carbon initiatives in the partner cities. Over 100 ongoing or recent technical and non-technical measures were

identified, with the majority concentrated around three key themes: *Built Environment*, *Energy* and *Transport*. Most initiatives were characterised by a short lifespan (less than 5 years) and were set up to respond to EU targets, with significant funding contributions from the European Union. The findings of the inventory confirmed "governing by experimentation" as the dominant mode of transitions-related decision-making.

Building on the inventory, the follow-up project employed a methodology that brought 'analysts' (i.e. the Transition Team) and 'local actors' together to co-produce shared 'maps' of each transition cluster as a socio-technical system network. By mapping out the connections between actors and low-carbon innovation projects in a particular city, the relevant players, their interrelations, as well as their positions within the socio-technical system could be identified. Dots and squares in the network maps represented projects and stakeholders (respectively), and ties connected the different types of nodes illustrating the involvement of actors in the surveyed low-carbon initiatives. According to the UTL concept, such system analysis "provides actors with a systematic mapping of the situation and problem that can enable them to look beyond their own expertise and perspectives and to understand the interconnectedness of the system(s)" (Nevens et al., 2013: 114). Examples of the maps produced at various stages of the TC project are shown in Figures 2 and 3.

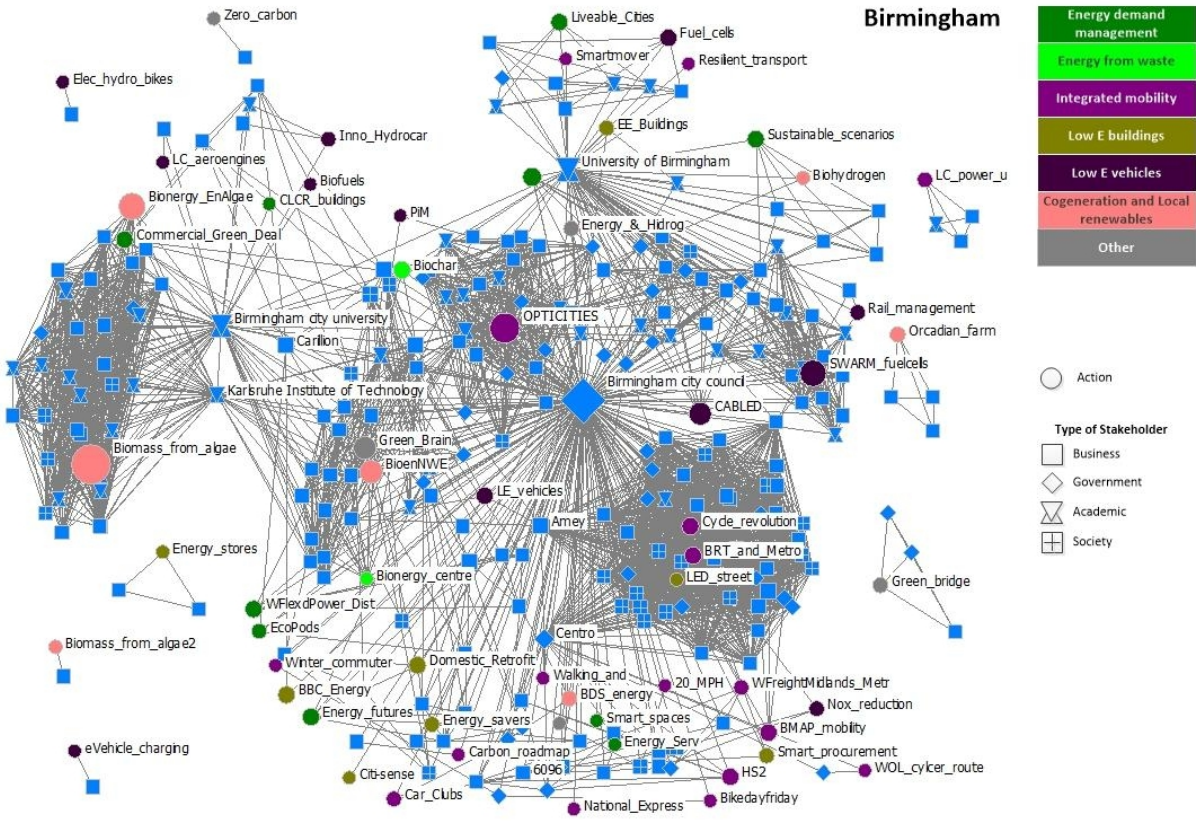

Figure 2 – Stakeholder network map, Birmingham (whole system including all clusters; TC, 2015)

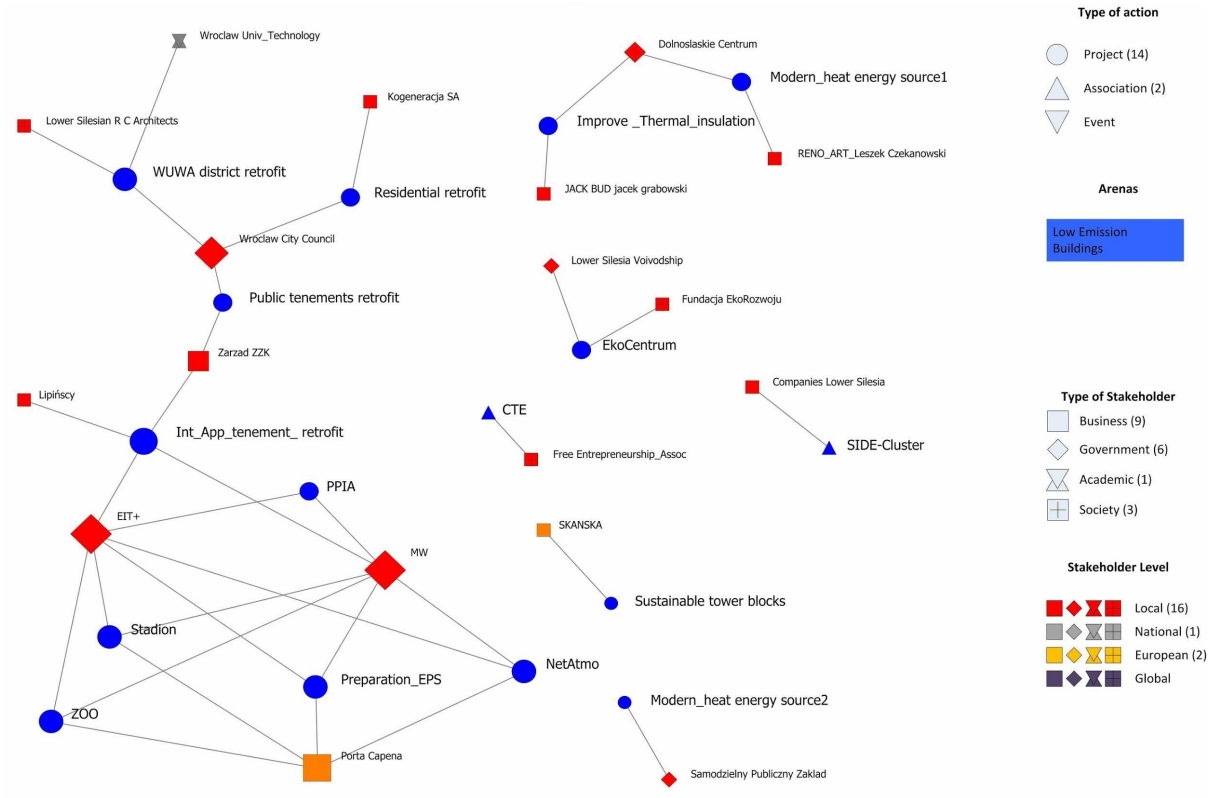

Figure 3 – Stakeholder network map, Wroclaw (Built Environment cluster; TC, 2015)

The maps were designed to be used in the subsequent phases to identify gaps (lacking action in certain fields) and potential for further linkages between existing initiatives within the cluster in the form of future projects or learning opportunities, which - combined with the knowledge of local stakeholders - were expected to provide systematic (and realistic) pathways towards local emissions reduction targets. Theoretically, the underlying principle of the mapping exercise was to develop knowledge about opportunities within the cluster, to broaden the scope of existing activities by identifying and including further elements of the socio-technical system, and ultimately, to suggest options for the scaling-up of selected initiatives into system-wide change. As a TC-partner explained: "Transition Cities suggested us to identify the gaps in the municipality's projects and strategy-landscape. Therefore, we started to map our projects and actors in the field of local climate action. As a result, we found out that there were no sustainability projects for our retail sector, […] especially for small shops in the city centre. […] Thus, we looked for examples from other cities to start a new project in this field" (Interview 2, 2016).

3.2.2 DEVELOPING LONG-TERM GOALS: ENVISIONING

'Envisioning' in TM refers to the process of developing visions depicting the desired future state of particular socio-technical systems. Visions have multiple roles in the various phases of the transition, such as: creating a shared problem definition; providing long-term goals to work towards; outlining the change trajectory and coalition building (gaining support from stakeholders in order to obtain resources) (Rotmans and Loorbach, 2009; Loorbach, 2007). Therefore, the involvement of local change agents is likely to increase the success of envisioning (Nevens et al., 2013).

In the Transition Cities project, it was envisaged that strategic goals within each challenge-led (i.e. focusing on the desired systemic change rather than the introduction of specific technologies) multi-actor cluster (Built Environment, Energy, Transport) would be developed through stakeholder integration, with the aim of resource and knowledge pooling and building local engagement in low-carbon innovation. A number of stakeholders were involved, such as relevant local companies (for example utilities), small businesses, start-ups, third sector and citizens' organisations, research institutes, business organisations and universities. Several stakeholder workshops were organised in each city, where the results of the cluster maps were discussed and possible new actions identified. This process was also seen as a tool to clarify the system configurations found in the partner cities to enable comparison between them on the one hand, and with leading global models of successful system transitions on the other.

3.2.3 BACKCASTING: AGENDA-BUILDING AND EXPLORING PATHWAYS

Starting from an engaging vision supported by the stakeholders involved, the next step is to convert this long-term goal into sets of interim targets, resulting in strategic pathways leading to realisation. Pathway building includes discussions and negotiations among actors about various possible scenarios. Consequently, specific local and professional knowledge becomes crucial to the progress towards operationalisation (Nevens et al., 2013; Voß et al., 2009; Quist and Vergragt, 2006).

In the TC, the previously introduced network maps were given strategic importance in this phase; potential transition pathways were to be developed in each cluster (Built Environment, Energy, Transport) using the information in the maps within the frames of further stakeholder workshops. The project proposal (TC, 2013: 18) defined 'transition pathways' as "[…] a route for consolidating, strengthening and changing the structure and dynamics in a particular cluster in order to 'make transitions happen' more effectively and speedily".

Building on the findings from the inventory and the cluster maps (figures 2 and 3) analysts and stakeholders worked together to co-produce possible pathways, visualised as desired future network configurations in each cluster. By doing so, stakeholders could uncover gaps in the cluster maps that acted as barriers to systemic transformation. Through this method, space for niche innovation was made visible, opening up the field for identifying relevant actions based on either local potential or examples from the partner cities that could be transferred to the city in question. Examples of gaps included: missing activities and projects; missing connections between stakeholders; and missing stakeholders who had the potential to contribute to existing projects.

Transferring successful innovation experiments and policy models between clusters and/or cities was another option for pathway-creation supported by the TC methodology. The cluster mapping approach was intended to make it easier for cities to draw on good practices from elsewhere by offering synthesized information about project and partners on one hand, and missing activities on the other. During the course of the TC project, replication became a priority due to the need to exemplify the usefulness of the methodology when reaching out to other cities.

3.2.4 TAKING SHORT-TERM ACTION: EXPERIMENTING

"Transition management emphasizes the need and importance of small-scale experiments" (Porter et al., 2015: 527), because they have the potential to develop new solutions or create new practices

through pilot projects, as well as to facilitate learning processes about the effects of small-scale interventions in order to ease future action and decisions up scaling (Kivimaa et al., 2017). Transition experiments, conducted in a real-life societal context involving multi-actor alliances, are characterised by Nevens et al. (2013) as (1) having a clear connection to a specific societal challenge; (2) transforming existing practices in an innovative way and ultimately leading to radical change in structures, cultures and/or technologies and (3) having an explicit learning orientation e.g. in terms of obtaining new knowledge, competences, standards or values.

Several transition experiments were set up in the partner cities that fit the above description, with the help of the PC and TC projects. Experiments were selected on the basis of their potential to contribute to the overall strategic goals and their fit to the identified pathways within the clusters of Built Environment, Energy and Transport. The preliminary system analysis, aided by the network maps, ensured that the supported initiatives were innovative in the specific urban contexts. According to the Climate-KIC projects' rationale, innovative pilots, together with the newly formed collaborations, could pave the way to complex socio-technical transformations in the partner cities.

In order to facilitate the experimentation process, the TC project provided funding for the partner cities in the form of a grant scheme to deliver the transition experiments, to test the applicability of the cluster mapping methodology for identifying opportunities, and to ensure stakeholder engagement. Three kinds of grants were distributed: 'Experiment' (responding to the gaps identified by the transition cluster mapping); 'Replication' (transferring a successful scheme from one place to another); and 'Service Innovation' (supporting start-ups to develop services or innovations responding to specific local needs). All experimentation had to be undertaken and completed within twelve months and preference was given to pilots undertaken in more than one city at the same time. All project proposals had to be approved by the Transition Team.

In 2014 six *Experiments* were undertaken: Valencia developed an 'Innovative methodology for urban heat stress mapping', while Wroclaw launched a 'Kids for Climate' programme to teach pupils about the importance of climate change and ways to reduce carbon emissions. In the same year the partner cities selected twelve *Service Innovation Grants*. For example, Birmingham supported a start-up that aimed to develop a device that could be inserted in chimneys to prevent cold air flowing into the house. In another example, Budapest funded a heavy cargo bike that can carry materials up to 300 kg but is still easy to operate.

Although the project lead constantly emphasised that "it is politically important that replication of successful transition experiments takes place" (TC Meeting Notes 5, 2015), only one 'Replication' attempt was undertaken. In 2015 the city of Bologna adapted Frankfurt's 'LabL Initiative', which was supported through the *Service Innovation* scheme previously. LabL is a start-up that targets small shopkeepers and businesses and provides them advice on becoming more sustainable through making their product range and services less carbon intensive, as well as giving energy advice to shop owners to reduce energy usage. It was identified with the help of the TC cluster maps that similar action targeting small local businesses was missing in Bologna. Therefore, through cooperation between Frankfurt and Bologna (with both municipalities and the start-up) the experiment was translated to fit the local context in the Italian city: Bologna developed its own approach to take action in this field on the basis of the German example (Interview 2, 2016). However, as both experiments in Frankfurt and

Bologna are still in the implementation phase, a final evaluation of the replication attempt is not yet possible.

3.2.5 Monitoring and Evaluation

Social learning about alternative ways to transition governance is one of the basic principles of the TM approach (Beers et al., 2014; Loorbach, 2010; Rotmans and Loorbach, 2006). Therefore, continuous monitoring of the experiments and evaluation of their impact on the urban socio-technical systems remains an integral element of the UTL concept, too. Despite such emphasis in theory, in the case of the Climate-KIC projects this aspect of the transition cycle was less articulated in contrast to system analysis and preparation for setting-up experiments, and no recommendations or assistance were given to the project partners on how to follow-up the experiments. In practice, the projects' short lifespan made the impact assessment difficult or even impossible.

3.3 Pioneer Cities and Transition Cities as Representations of TM in the Urban Context

In the previous section we described the Pioneer Cities and Transition Cities projects through the lenses of TM, following the Urban Transition Labs framework. This allowed us to contrast the PC and TC projects' rationale with the existing literature on managing low-carbon transitions in cities.

In our case study projects, the socio-technical systems perspective of transition theories was translated into the concept of 'challenge-led clusters' of urban transitions, which took a user centric perspective of urban systems, with a focus on problem solving. The cluster maps were instrumental parts of the process of introducing systems thinking to municipal staff. Having been developed as a tool for building connections between strategy and practice, they were expected to contribute to the understanding of scaling up local innovation processes by enabling municipal officers to recognise where transition potential lied in their cities. They were intended to be used as tools guiding the whole transition process and the long-term vision was conceptualised as a desired, idealistic cluster network; pathways were to be built through increasing the size and density of the cluster maps to achieve the desired end-state; and experiments were expected to be chosen on the basis of contributing to such change. Thus, in terms of concept, there was an *a priori* assumption in the project design stage that the impact of low-carbon initiatives could be enhanced by reducing fragmentation within and between clusters, and that this required a strategic approach from local authorities. Moreover, fragmentation (visualised as gaps in the network maps) was interpreted as a result of insufficient knowledge among decision makers regarding the elements, structure and functioning of socio-technical systems within the 'challenge-led clusters'.

Ultimately, we found considerable resemblance between the Climate-KIC projects' design and the UTL, particularly in terms of the organisational structures used for delivering transition ambitions. The Project Consortium corresponded to the 'T-Team', the initial workshops to what Nevens et al. (2013: 118) term 'city transition arenas', and the cluster workshops to the transition arenas involving 'multiple thematic network players'. It was expected that, in line with the TM and UTL approaches, such organisational setup would be key in converting the messy, unstructured local sustainability initiatives into systemic urban transitions; or in other words, in making transition processes more governable in the partner cities.

However, outcomes of the projects suggest that setting up experiments with a strategic approach, (i.e. putting the lessons learnt from the network and system analysis into practice) was not a straightforward process. The project lead and the partners were faced with various challenges on the conceptual, methodological and operational levels and, as a result, the Pioneer Cities and Transition Cities projects' impact remained limited, apart from some sporadic albeit promising developments. In Section 4 we describe the most important issues that influenced the real-life success of the Climate-KIC projects and contrast our findings with previous (critical) comments on the TM concept.

4. DISCUSSION

The PC and TC projects provided empirical examples of the difficulties of tailoring TM to the urban context. Based on our observations during the course of the projects, on feedback from project partners and on the reports of the projects' outcomes, we can conclude that, despite (a) the adoption of the TM concept as guiding principle and (b) the resemblance with the UTL framework, the projects did not lead to overcoming the messy and contingent character of decision-making surrounding the ongoing low-carbon transition processes in the partner cities. Instead, a number of (often overlapping) issues that limited the success of efforts to make urban transitions more governable, were highlighted. The aim of the present article is to discuss common barriers which were found to be relevant in a variety of contexts from across Europe, and thus, worthy of consideration when planning or setting up EU initiatives supporting urban sustainability transitions. In the following, we explain how these issues counteracted the PC and TC projects' aim to make transitions happen via steering local low-carbon innovation activities.

First, the dominant hypothesis on the **conceptual level** was that the governability of urban transitions could be enhanced through developing coherent 'low-carbon innovation systems' by building links between already existing but isolated initiatives. According to the PC and TC projects' rationale, such fragmentation counteracted efficiency and, therefore, the way forward to augment the impact of local low-carbon activities was to reduce it. Moreover, there was an implicit assumption that fragmentation was caused by information deficit in relation to the structure, elements and the functioning of innovation systems. However, during the project meetings it became increasingly clear that fragmentation was produced, reproduced and maintained by a variety of reasons other than the lack of information, such as previous collaboration experiences with local stakeholders, preferences of the political leadership, existing approved urban development plans, funding and resource availability, silo-thinking and so on (TC Meeting Notes 1, 2015; TC Meeting Notes 4, 2016). This was rather unsurprising, as similar issues related to the politics of transitions have already been discussed in a more generic sense by others (c.f. Meadowcroft, 2011, 2009; Voß and Bornemann, 2011; Hendriks, 2009). In our case studies, municipal officers and local stakeholders with context-specific knowledge seemed to be rather well-informed about the relationships between ongoing initiatives in their cities: "The maps are just a reflection of what is going on in Frankfurt, and people are aware of what is going on, I mean, they are not sleeping" (Interview 1, 2016). Consequently, project partners have consistently questioned the results of the system analysis and often disagreed, as they believed the results did not reflect *reality* as they saw it. From their perspective, inventing new transition agendas from scratch on the basis of network analyses seemed unnecessary due to the existence of mid and long-term urban development plans supported by the dominant (elected) political elite and, in most cases, developed through consultations with relevant stakeholders and citizens. In fact, all of the eight

city authorities participating in the TC project had signed up for the Covenant of Mayors initiative (www.covenantofmayors.eu) and, therefore, prepared a 'Sustainable Energy Action Plan' (SEAP).

Second, the projects' **methodologies** intended to visualise fragmentation on the level of urban sub-systems ('challenge-led clusters') of Built Environment, Energy and Transport. This was achieved through employing a network approach: cluster maps were developed which showed the connections (or the lack of them) between ongoing initiatives and stakeholders involved in their realisation. Although a large body of information was captured, it was synthesised into abstract graph drawings (c.f. Fig. 2 and 3); therefore, making sense of the cluster network maps required some level of familiarity with the concept of social network analysis (Knoke and Yang, 2008; Provan et al., 2007), as well as capability to translate between the abstract networks, the local transition processes, and vice versa. Typical issues included misunderstandings about the kinds of actors to be represented on the maps (i.e. knowledge flows or only direct involvement); the types of projects and initiatives to be included (i.e. physical interventions versus feasibility studies, impact assessments, etc.); and the level and nature of detailed information required to turn the network maps into appropriate tools to support decision-making (TC Meeting Notes 1, 2015; TC Meeting Notes 2, 2015; TC Meeting Notes 5, 2016). In practice, city representatives found it particularly difficult to understand the content of actor and system analyses based on the network maps and felt that the approach was too different from what they were expected to be doing in 'real life'. They argued that adopting a network approach, i.e. developing the capability to be able to relate the content of the network analyses to ongoing transition activities and decision-making, required more investment (both in terms of time and effort) from their part than the potential (short-term) gains that it could have offered in return (TC Meeting Notes 2, 2015; TC Meeting Notes 3, 2016). These observations from the PC and TC projects with regards to resistance to imposed transition thinking, terminology and methodology represented universal issues relevant in all of the participating cities echoing the findings of Avelino's (2009) analysis of transport infrastructure innovation in The Netherlands.

Third, **operational difficulties** arose from the administrative issues set out by the funding organisation, Climate-KIC, including limited lifespan, budget and a focus on reportable, concrete outcomes. Due to the inflexibility in relation to how and when the funding could be spent, the different management tasks (analysing - envisioning - backcasting - experimenting) had to be implemented in parallel to each other (TC Meeting Notes 6, 2016). This situation resulted in frustration and confusion among the project lead, project partners and other stakeholders in the cities and counteracted the implementation of strategic approaches. As a consequence, for example, the cities of Frankfurt and Valencia turned to a 'Competition of Ideas' approach to identify new projects, rather than following the strategic model. Thus, the experience gained from our case studies suggests that, since (urban) transitions are inherently conflictual processes unfolding over a long lifespan, it may be difficult for short-lived transition projects similar to the PC and TC to achieve considerable change. Moreover, the evaluation of their impact appears to be problematic (Meadowcroft, 2009).

Fourth, as the process of making the maps more user-friendly and informative following the feedback from project partners ran parallel to the operative tasks, the possibility to use the maps as tools for strategic management purposes was limited (Interview 1, 2016; Interview 2, 2016). Consequently, most cities provided extra funding for ongoing or already planned projects through the PC and TC funding, which (more or less) also fit potential gaps in the network maps. The most notable example of this approach came from Wroclaw, where the TC funding was used to finance the "Kids for Climate"

Programme which was an education initiative for pupils. However, the project did not fit the thematic focus of Transition Cities on the clusters of buildings, transport and energy, nor was it newly developed on the basis of the network analysis. This did not strike us as a surprise considering the recent tendency towards austerity: local governments have been targeted by continuous budget cuts in the past decades and, at the same time, they were made responsible for delivering additional tasks and services with a decreased budget (Hajer, 2016). In this context, due to the availability of funding and resources for specific tasks and services, it often seemed more logical for project partners to support existing or planned initiatives instead of developing entirely new projects on the basis of the findings of the system analyses.

Fifth, coordination by project partners of the stakeholder networks in their respective cities also proved difficult. The main reason for this was that, contrary to the project lead's expectations, the representatives of the cities were not high-profile officers in their respective municipalities: four cities were represented by mid- or lower level management from a municipal department (Birmingham, Budapest, Frankfurt and Castellon) and four by external bodies operating at arm's-length to local governments (Valencia, Modena, Bologna and Wroclaw). Consequently, in the context of internally fragmented local authorities inherently prone to silo-mentality and professional rivalries between departments, project partners had little or no authority and/or influence over crucial decision-making processes (Interview 1, 2016; Interview 2, 2016; TC Meeting Notes 4, 2016; TC Meeting Notes 3, 2016). This was problematic because, on the one hand, their directors (as well as other departments within the municipality) could easily dismiss the results of network analyses when allocating funding for pilot projects and, on the other, they were also less able to engage individuals external to the municipality with sufficient competency to influence decisions made at their respective organisations.

THEORY (PC & TC)	LEVEL	PRACTICE
Fragmentation within and between clusters (systems) is a result of lack of knowledge.	**CONCEPTUAL**	Fragmentation was a 'context' issue.
Network approach to visualise system fragmentation.	**METHODOLOGICAL**	Network approach was too abstract and requires specialised knowledge.
Cluster network maps to be used as tools to guide the selection of experiments.	**OPERATIONAL**	Extra funding provided for ongoing and/or planned projects.
Strategic approach to implementation following the transition management cycle.		Management tasks ran as parallel activities conteracting the strategic approach.
Local authorities as single actors with a consensual, common approach to urban sustainability transitions.		Internally fragmented, hierarchically organised local authorities prone to silo mentality and rivalries between departments.

Table 1: Overview of the barriers identified to TM implementation on the urban level.

The five challenges listed above were the main contributors to limiting the success of the PC and TC projects in harnessing the potential of the TM approach to make urban transitions governable. In fact, during the course of the two projects, 'transition-management-in-practice' looked a bit more like policy-as-usual than it would be recommended by 'transition-management-in-theory' (Meadowcroft, 2009: 336). Due to being constantly faced with various challenges, municipal administrators and other actors involved in distributing funds for low-carbon experiments were found to act in rather pragmatic ways, as opposed to the systematic ways that TM techniques require. In other words, the real-life decision-making related to attempts at managing urban transitions fit Lindblom's (1959) description of 'muddling through'. In practice, project partners and other decision-makers were found not to search systematically for rational optimum solutions; but instead they 'did what they could' in order

to satisfice in a challenging environment (Forester, 1984), often choosing the first available solution which 'ticked some of the boxes'. However, we argue, this is not to be misunderstood as the unwillingness or incapacity of municipal staff for systematic management; rather, it is an answer to the various barriers they are confronted with in their daily work. Thus, we found that the contextual blockages that hindered the emergence of more strategic approaches to guide experimentation processes in European cities also limited the potential of imposed TM techniques to support local low-carbon transitions. As a result, a 'shallow version' of TM was applied in practice, which could not succeed in overcoming the messy and contingent character of decision-making surrounding ongoing urban low-carbon transition processes.

To what extent our observations can be generalised outside of the context from which they emerged is open to debate and further research. First, the study focused on urban transition management led by municipal actors or arm's-length bodies. Therefore, we do not claim that the challenges identified automatically hold in the case of urban transition management processes led by non-governmental actors (i.e. citizen associations, local businesses, universities etc.). Second, the article analysed two projects which were set up in the specific context of the European Union. Thus, extending the findings to other countries, regions or cities would require further scientific enquiry. However, research conducted by Castán Broto and Bulkeley (2013) suggests that similarities might exist in the ways in which local low-carbon transitions have taken shape in recent years. Surveying one hundred cities across the world they (a) found that local authorities were key actors in local climate action; (b) showed that urban transition experiments are particularly focused on infrastructure, including energy, built environment and transport; and (c) demonstrated that low-carbon experimentation in cities does not tend to challenge the established ways of urban governance and resource management and mainly represents incremental innovation (Castán Broto and Bulkeley, 2013). Thus, the findings of the survey show significant resemblance to the experience from the PC and TC projects. Therefore, we see the possibility that the identified barriers (or at least the research approach) might, to some extent or in some form, be transferable to other cities and regions beyond the EU context. Despite the limitations discussed above, we believe that the analysis presented in this article provides useful and fresh insights into the practicalities of managing transitions in (European) cities.

5. CONCLUSION

This article focused on answering the research question set out in the Introduction: What obstacles may limit the potential of Transition Management (TM) to support urban low-carbon transitions? Thus, it contributes to the sustainability transitions literature with regard to the practicalities of managing transitions on the urban scale, where empirical research is still lacking (Bulkeley et al., 2015; Nevens and Roorda, 2014; Loorbach and Rotmans, 2010).

We opened with contrasting the two most prominent perspectives on the governance of urban sustainability transitions, 'governing by experiment' and 'Transition Management'. In light of the existing literature, we set out to investigate the practical applicability of the UTL concept in European cities, which, to date, is the most coherent conceptual framework for tailoring TM to the urban context. To do this, we provided an analysis of two EU-funded projects, Pioneer Cities and Transition Cities, and demonstrated that they could legitimately be considered manifestations of the UTL

framework. The analysis confirmed that the cases studies were relevant to the wider literature on governing urban transitions.

In the discussion section, the five most common barriers to introducing transition thinking to cities were presented. They emerged from the PC and TC projects, including (1) tensions between existing plans and new transition agendas; (2) resistance to imposed transition thinking and methodology; (3) contrasts between project time frames and expectations; (4) funding and resource issues as well as (5) municipalities' internal hierarchies and fragmentation. Connections to the existing critical literature were established in the cases of barriers (1) and (2), which described issues that have been discussed in previous studies (albeit not in relation to urban sustainability transitions specifically).

Finally, the discussion led us to the conclusion that, due to the persistence of the five obstacles, 'no-regret measures' on a case-by-case basis still dominate the local governance of low-carbon transitions in the partner cities. Thus, the results of our investigation confirmed previous findings within the literature which identified the pilot project based governing mode ("governing by experiments") as a key characteristic of contemporary urban climate change policy-making (Evans et al., 2016; Bulkeley et al., 2015; Bulkeley, 2013; Bulkeley and Castán Broto, 2013; While et al., 2004). We therefore subscribe to the view that 'experimentation' reflects a specific mode as well as a heterogeneous set of processes to combat climate change at the city level. Taking this as a starting point, we contend that, in order to maximise the practical usefulness of TM locally, the following two points should be considered.

Firstly, that sustainability transitions are inherently precarious, "due to the hardly reducible structural uncertainty they include" and conflictual social processes that are, "difficult to manage, with a variety of actors with diverse interests involved" (Rotmans and Loorbach, 2009: 185). This naturally clashes with the current output-focused and short-term design of funded urban transition projects like those studied in this article. Awareness of the messiness of (urban) decision-making, coupled with extensive expectation management in the preparation phase of urban transition projects, may contribute to developing more realistic and effective project designs. For example, instead of attempting to incorporate several TM steps in parallel due to restricted time frames and financial budgets, focus on certain key elements is recommended to meet preliminary expectations and to avoid frustration and 'muddling through'.

Secondly, that the contemporary multilevel governance context (at least in Europe) maintains a series of barriers to taking a more strategic approach to governing urban transitions, aside from a lack of knowledge within and beyond municipalities about how better solutions can be produced (Bulkeley, 2006). Since we arrived at this conclusion using the TM / UTL framework on 'real life' projects, we believe that their usefulness as conceptual lenses for identifying issues and finding solutions to the inherent tensions and barriers of urban sustainability transitions in specific local contexts is a research field worthy of further investigation.

In conclusion, future research on the practical governability of transitions in cities must pay more attention to the difficulties, conflicts and tensions that arise during the implementation phase of TM / UTL. This is expected to lead to a better understanding of whether removing such barriers may help either to convert the 'shallow' TM processes into real transitions or to facilitate the organic emergence of strategic approaches to transition governance.

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FIGURES